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November 2013

### FQD7N30

### N-Channel QFET® MOSFET

300 V, 5.5 A, 700 m $\Omega$ 

### **Description**

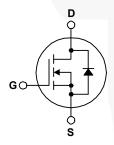
This N-Channel enhancement mode power MOSFET is • 5.5 A, 300 V,  $R_{DS(on)}$  = 700 m $\Omega$  (Max.) @  $V_{GS}$  = 10 V, produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state

• Low Gate Charge (Typ. 13 nC) resistance, and to provide superior switching performance • Low Crss (Typ. 12 pF) and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power • 100% Avalanche Tested factor correction (PFC), and electronic lamp ballasts.

#### **Features**

- $I_D = 2.75 A$





### Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted.

Symbol	Parameter		FQD7N30TM	Unit	
$V_{DSS}$	Drain-Source Voltage		300	V	
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C)		5.5	Α	
	- Continuous (T <sub>C</sub> = 100°C)		3.48	Α	
I <sub>DM</sub>	Drain Current - Pulsed	(Note 1)	22	Α	
V <sub>GSS</sub>	Gate-Source Voltage		± 30	V	
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)		380	mJ	
I <sub>AR</sub>	Avalanche Current	(Note 1)	5.5	Α	
E <sub>AR</sub>	Repetitive Avalanche Energy	(Note 1)	5.0	mJ	
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	V/ns	
P <sub>D</sub>	Power Dissipation (T <sub>A</sub> = 25°C) *		2.5	W	
	Power Dissipation (T <sub>C</sub> = 25°C)		50	W	
	- Derate above 25°C		0.4	W/°C	
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +150	°C	
T <sub>L</sub>	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds.		300	°C	

#### **Thermal Characteristics**

Symbol	Parameter	FQD7N30TM	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.5	
	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	110	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (*1 in <sup>2</sup> Pad of 2-oz Copper), Max.	50	

### **Package Marking and Ordering Information**

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQD7N30TM	FQD7N30	DPAK	Tape and Reel	330 mm	16 mm	2500 units

### **Flectrical Characteristics**

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Uni
Off Cha	aracteristics					
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	300			V
ΔBV <sub>DSS</sub> /ΔT	Breakdown Voltage Temperature Coefficient	$I_D$ = 250 μA, Referenced to 25°C		0.3		V/°(
I <sub>DSS</sub> _	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 300 V, V <sub>GS</sub> = 0 V			1	μΑ
		V <sub>DS</sub> = 240 V, T <sub>C</sub> = 125°C			10	μΑ
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V			100	nΑ
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V			-100	nA
On Cha	aracteristics					
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	3.0		5.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.75 A		0.53	0.7	Ω
9 <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 50 V, I <sub>D</sub> = 2.75 A		4.0		S
Dynam	ic Characteristics					
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz		470	610	pF
C <sub>oss</sub>	Output Capacitance			100	130	рF
C <sub>rss</sub>	Reverse Transfer Capacitance			12	16	pF
Switchi	ing Characteristics					
t <sub>d(on)</sub>	Turn-On Delay Time	V = 450 V L = 7.0 A		13	35	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{DD} = 150 \text{ V}, I_{D} = 7.0 \text{ A},$ $R_{G} = 25 \Omega$		75	160	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	NG - 20 12		25	60	ns
t <sub>f</sub>	Turn-Off Fall Time	(Note 4)		35	80	ns
Qg	Total Gate Charge	V <sub>DS</sub> = 240 V, I <sub>D</sub> = 7.0 A,		13	17	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>GS</sub> = 10 V		3.4		nC
Q <sub>gd</sub>	Gate-Drain Charge	(Note 4)	/	6.4		nC
Drain-S	Source Diode Characteristics a	nd Maximum Ratings				
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				5.5	Α
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				22	Α
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 5.5 A			1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 7.0 A,		150		ns
Q <sub>rr</sub>	Reverse Recovery Charge	dl <sub>F</sub> / dt = 100 A/μs		0.74	//	μC

- **Notes:** 1. Repetitive rating : pulse-width limited by maximum junction temperature. 2. L = 21 mH, I<sub>AS</sub> = 5.5 A, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25  $\Omega$ , starting T<sub>J</sub> = 25°C. 3. I<sub>SD</sub>  $\leq$  7.0 A, di/dt  $\leq$  200 A/ $\mu$ s , V<sub>DD</sub>  $\leq$  BV<sub>DSS</sub>, starting T<sub>J</sub> = 25°C. 4. Essentially independent of operating temperature.

### **Typical Characteristics**

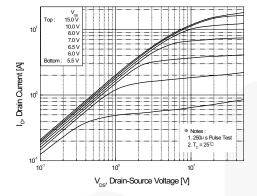


Figure 1. On-Region Characteristics

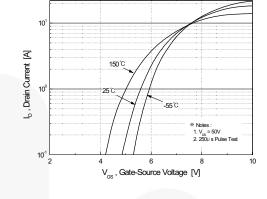


Figure 2. Transfer Characteristics

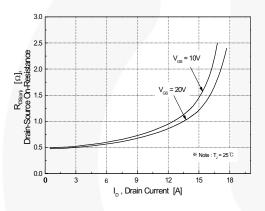


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

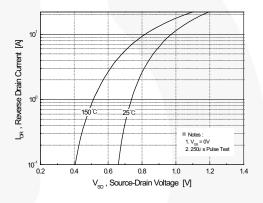


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

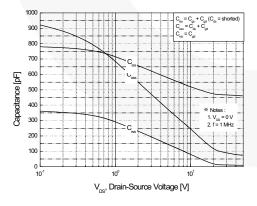


Figure 5. Capacitance Characteristics

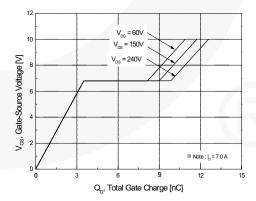
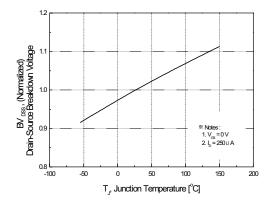


Figure 6. Gate Charge Characteristics

### Typical Characteristics (Continued)



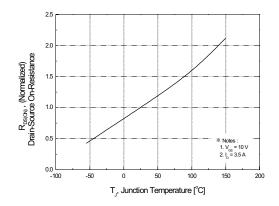
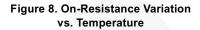
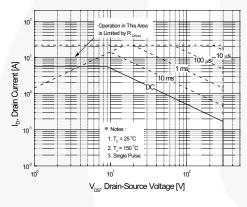


Figure 7. Breakdown Voltage Variation vs. Temperature





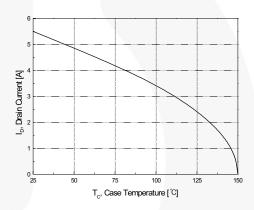


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

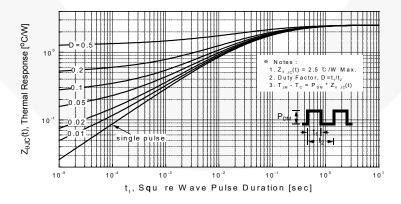


Figure 11. Transient Thermal Response Curve

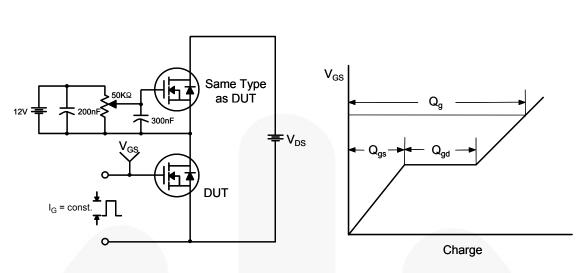


Figure 12. Gate Charge Test Circuit & Waveform

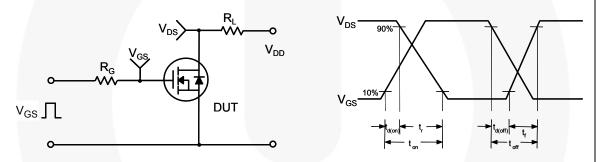


Figure 13. Resistive Switching Test Circuit & Waveforms

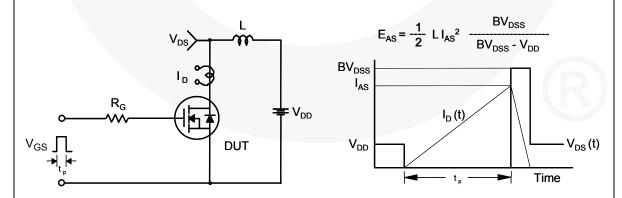
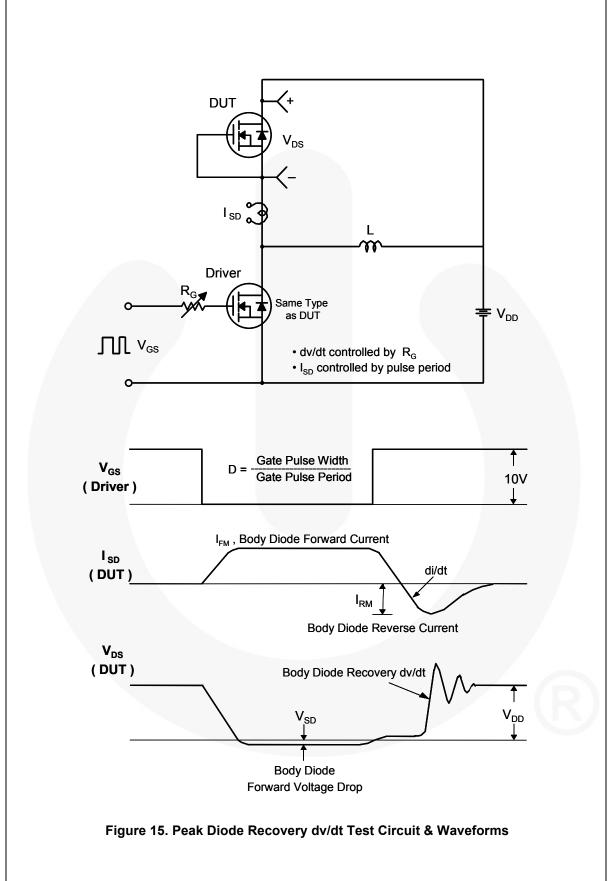


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



#### **Mechanical Dimensions**

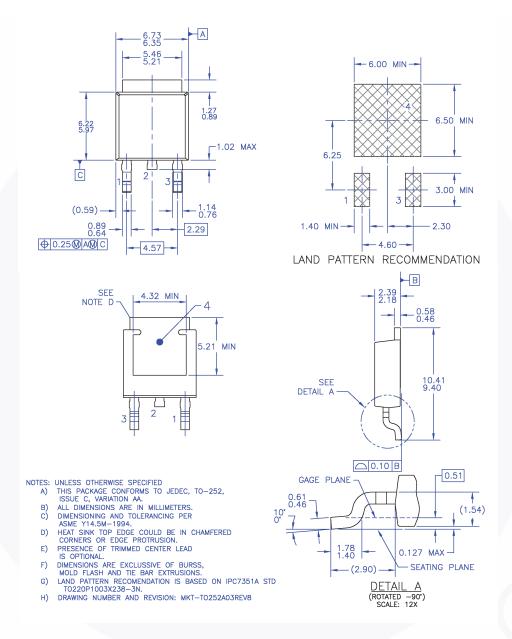


Figure 16. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

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